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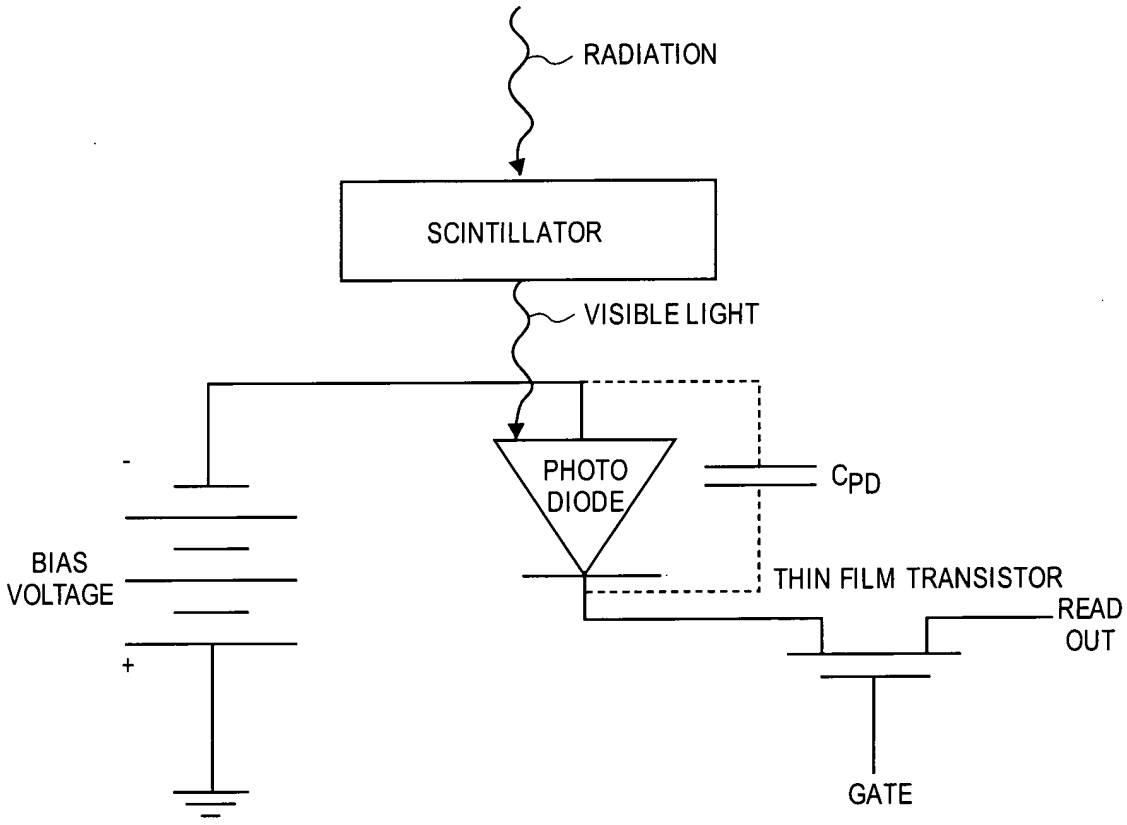


FIG. 1A

BEST AVAILABLE COPY

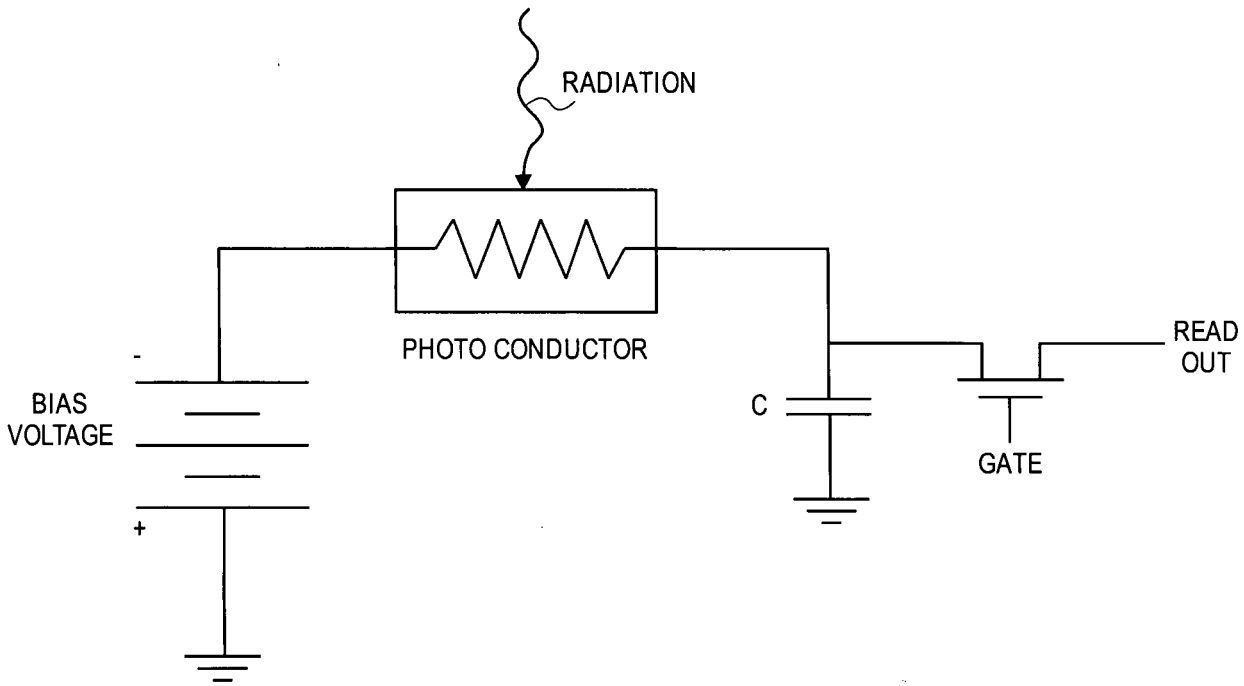


FIG. 1B

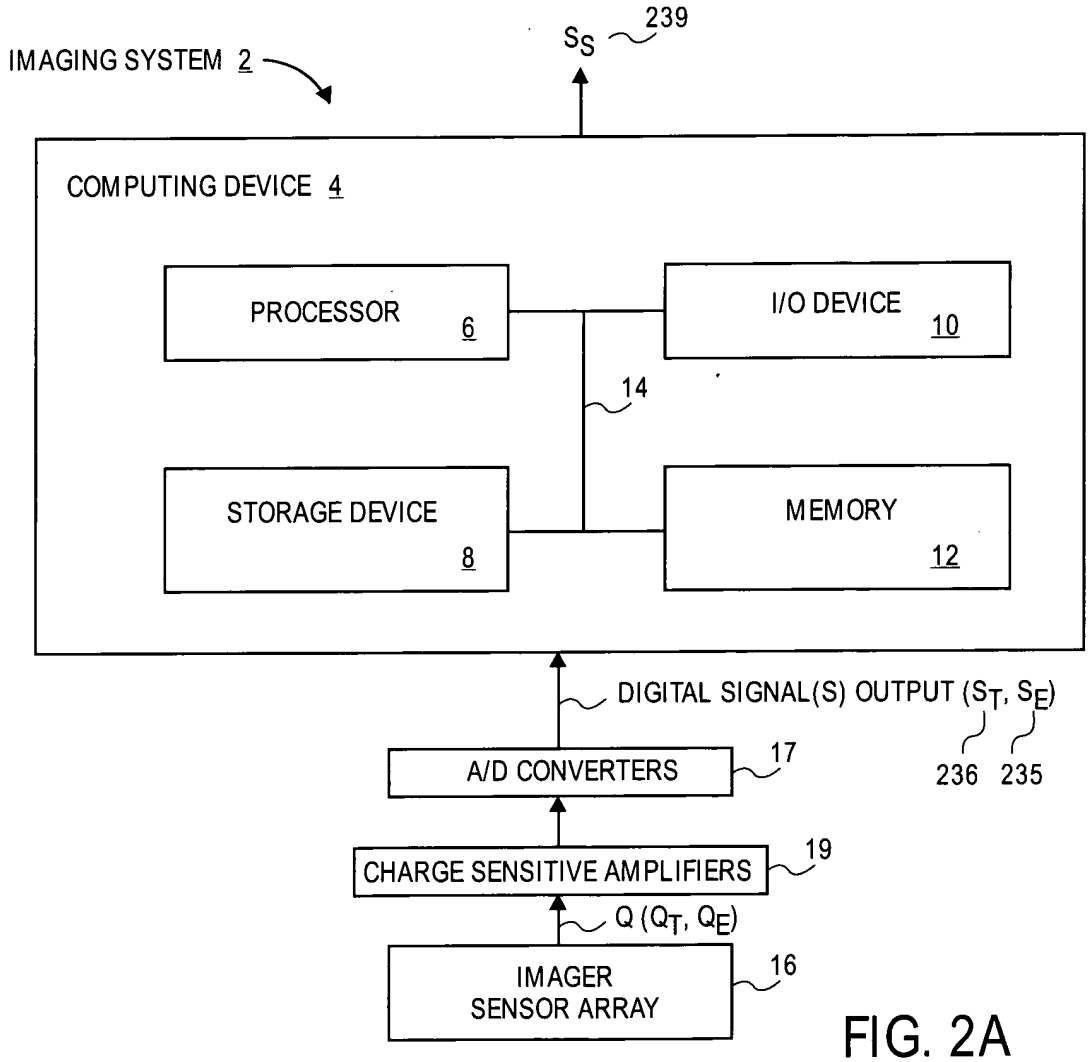

IMAGING SYSTEM 2
S_S 239
COMPUTING DEVICE 4
PROCESSOR 6
I/O DEVICE 10
14
STORAGE DEVICE 8
MEMORY 12
DIGITAL SIGNAL(S) OUTPUT (S_T, S_E)
236 235
A/D CONVERTERS 17
CHARGE SENSITIVE AMPLIFIERS 19
Q (Q_T, Q_E)
IMAGER SENSOR ARRAY 16

FIG. 2A

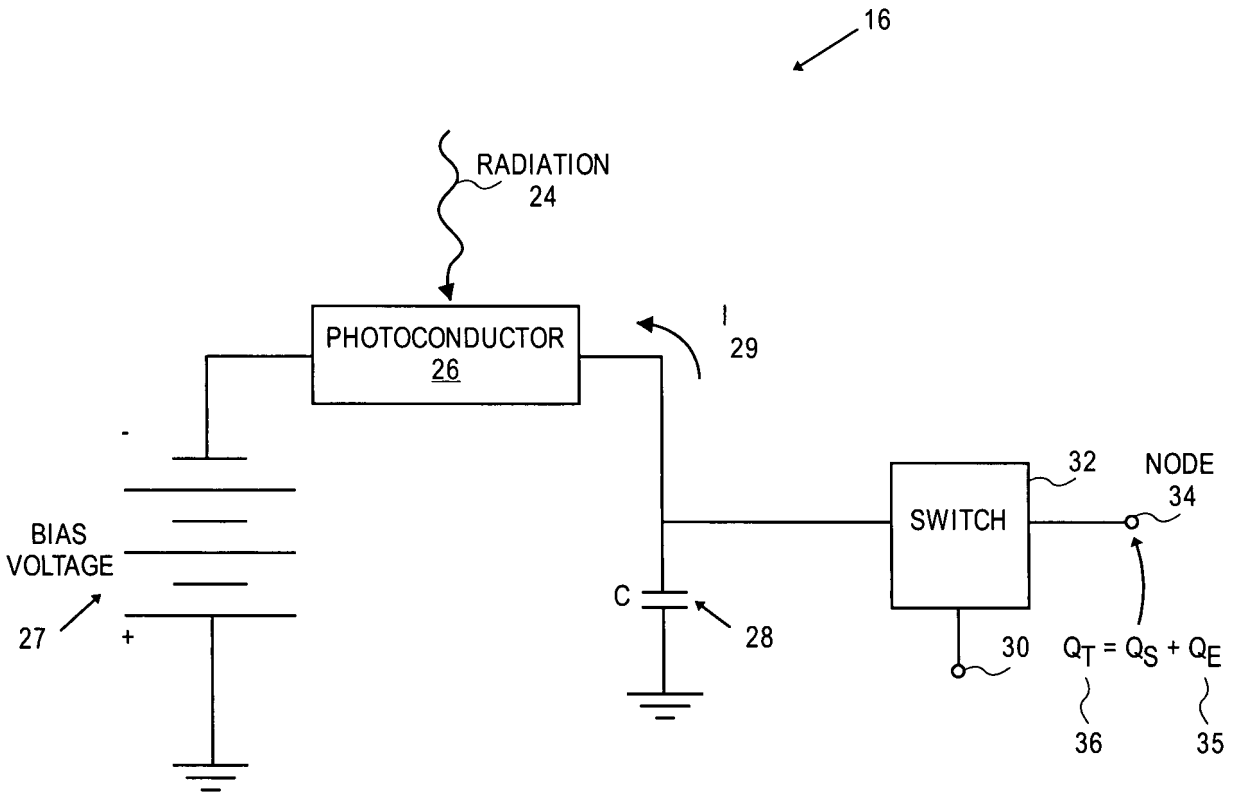

16
RADIATION
24
PHOTOCONDUCTOR
26
I
29
BIAS
VOLTAGE
27
-
+
C
28
SWITCH
32
NODE
34
30
$Q_T = Q_S + Q_E$
36
35

FIG. 2B

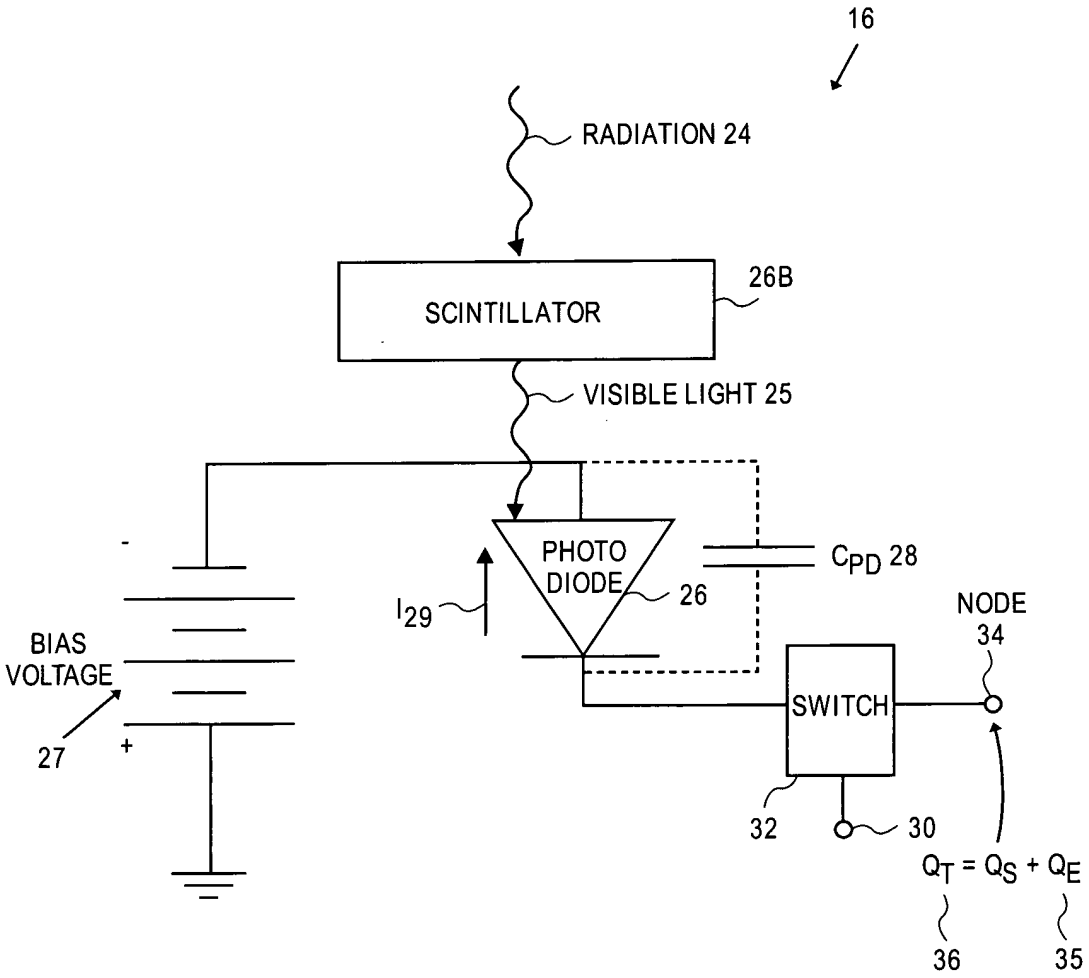

16
RADIATION 24
SCINTILLATOR
26B
VISIBLE LIGHT 25
PHOTO DIODE
26
C_{PD} 28
I_{29}
BIAS VOLTAGE
27
-
+
SWITCH
NODE 34
32
30
$Q_T = Q_S + Q_E$
36
35

FIG. 2C

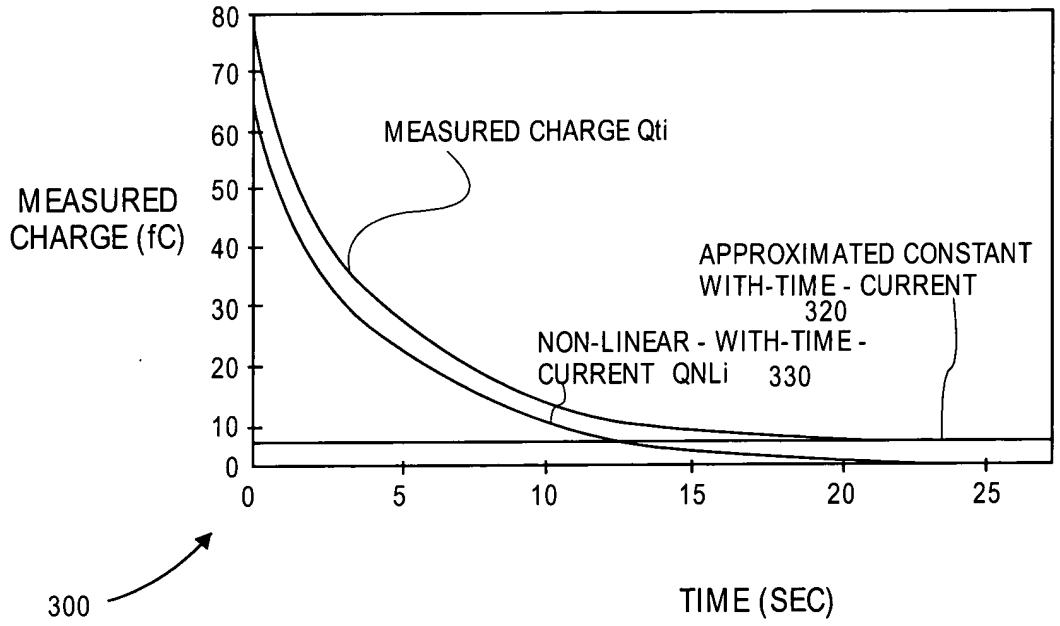


FIG. 3

$$I_E(t) = \frac{K}{t}, \quad Q_E(t) = \int_{t}^{t+T_i} I_E(t)\, dt$$

INTEGRATION TIME

FIG. 4

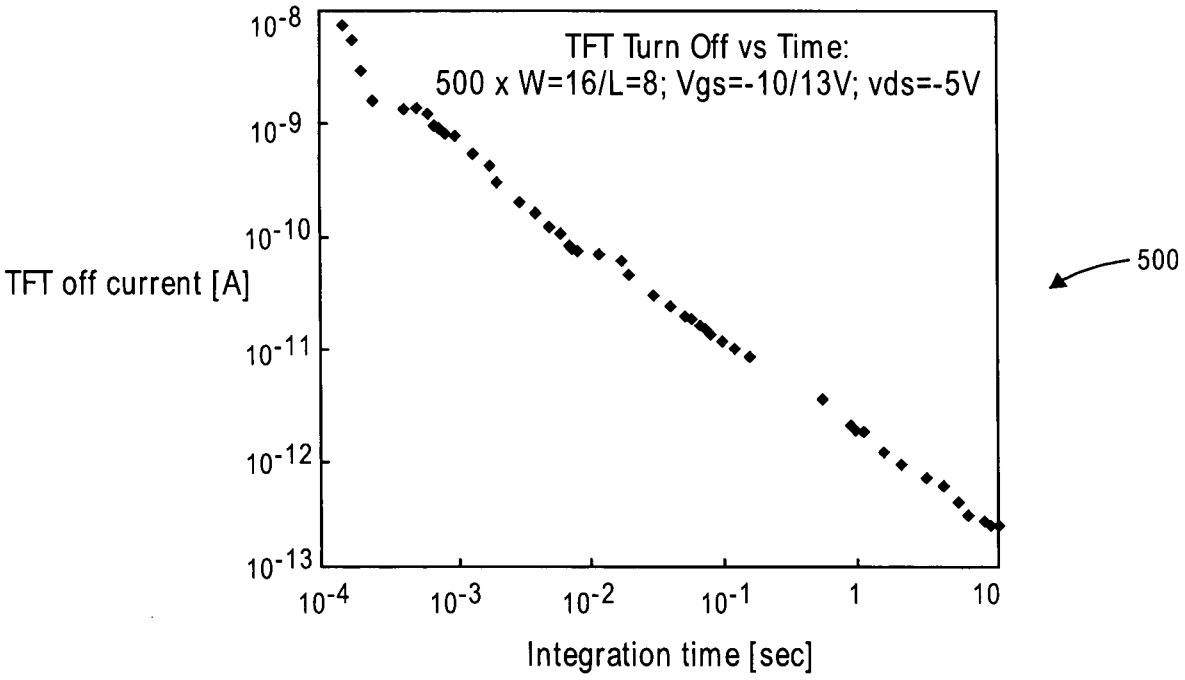

TFT Turn Off vs Time:
500 x W=16/L=8; Vgs=-10/13V; vds=-5V
TFT off current [A]
10-8
10-9
10-10
10-11
10-12
10-13
10-4
10-3
10-2
10-1
1
10
Integration time [sec]
500

FIG. 5

$$\text{INTEGRATION TIME } Ti = \frac{1}{\text{FRAME RATE}}$$

FRAME RATE (FPS)	INTEGRATION TIME (SEC)
0.1	10
1	1
30	0.033
100	0.01

FIG. 6

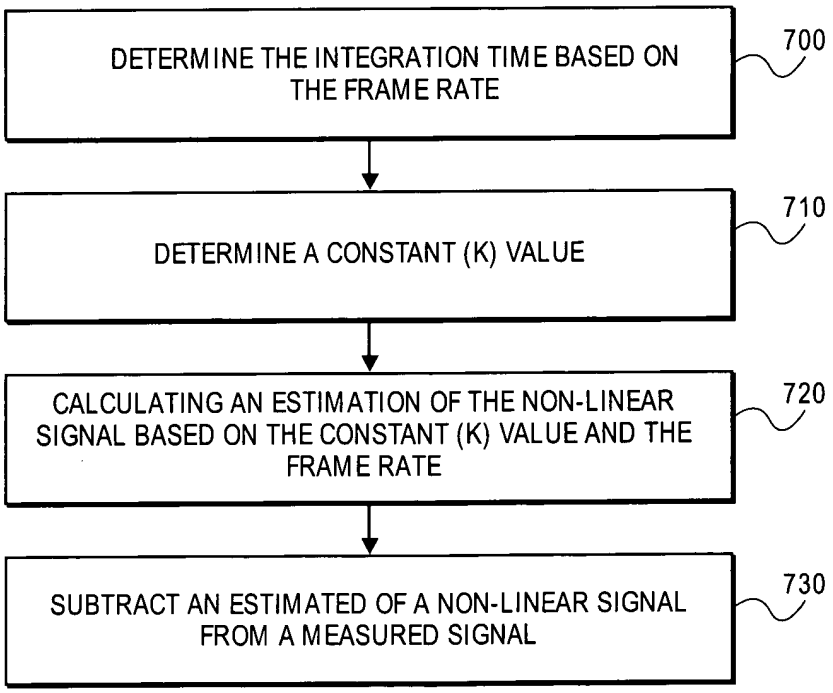


FIG. 7

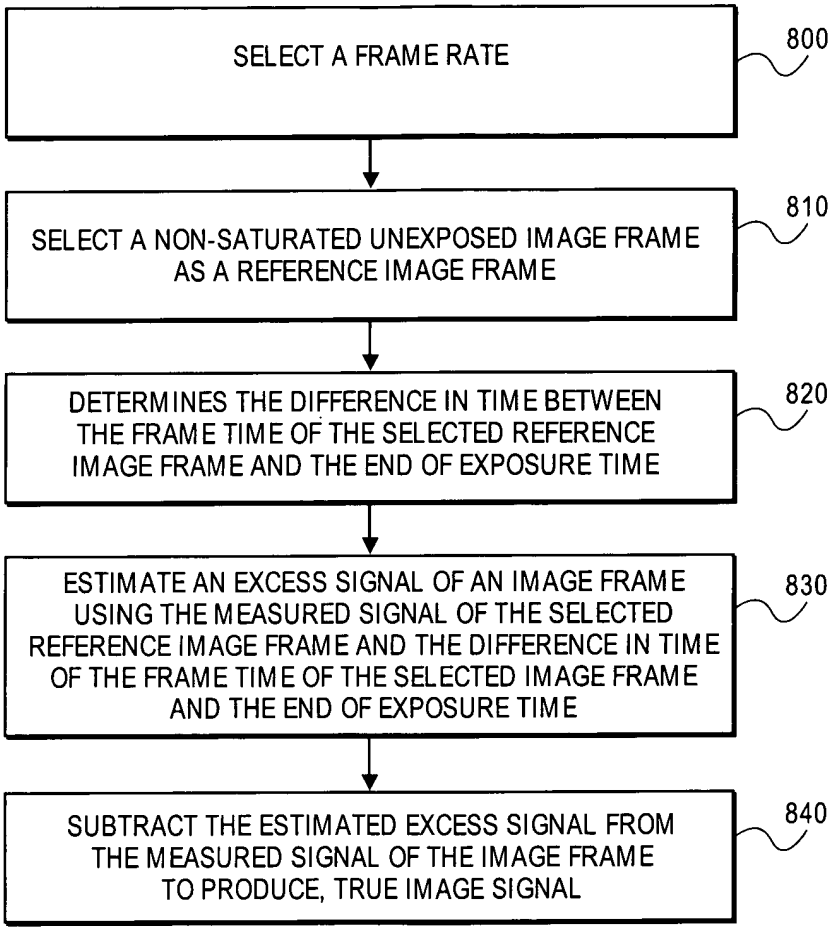

SELECT A FRAME RATE
800
SELECT A NON-SATURATED UNEXPOSED IMAGE FRAME AS A REFERENCE IMAGE FRAME
810
DETERMINES THE DIFFERENCE IN TIME BETWEEN THE FRAME TIME OF THE SELECTED REFERENCE IMAGE FRAME AND THE END OF EXPOSURE TIME
820
ESTIMATE AN EXCESS SIGNAL OF AN IMAGE FRAME USING THE MEASURED SIGNAL OF THE SELECTED REFERENCE IMAGE FRAME AND THE DIFFERENCE IN TIME OF THE FRAME TIME OF THE SELECTED IMAGE FRAME AND THE END OF EXPOSURE TIME
830
SUBTRACT THE ESTIMATED EXCESS SIGNAL FROM THE MEASURED SIGNAL OF THE IMAGE FRAME TO PRODUCE, TRUE IMAGE SIGNAL
840

FIG. 8

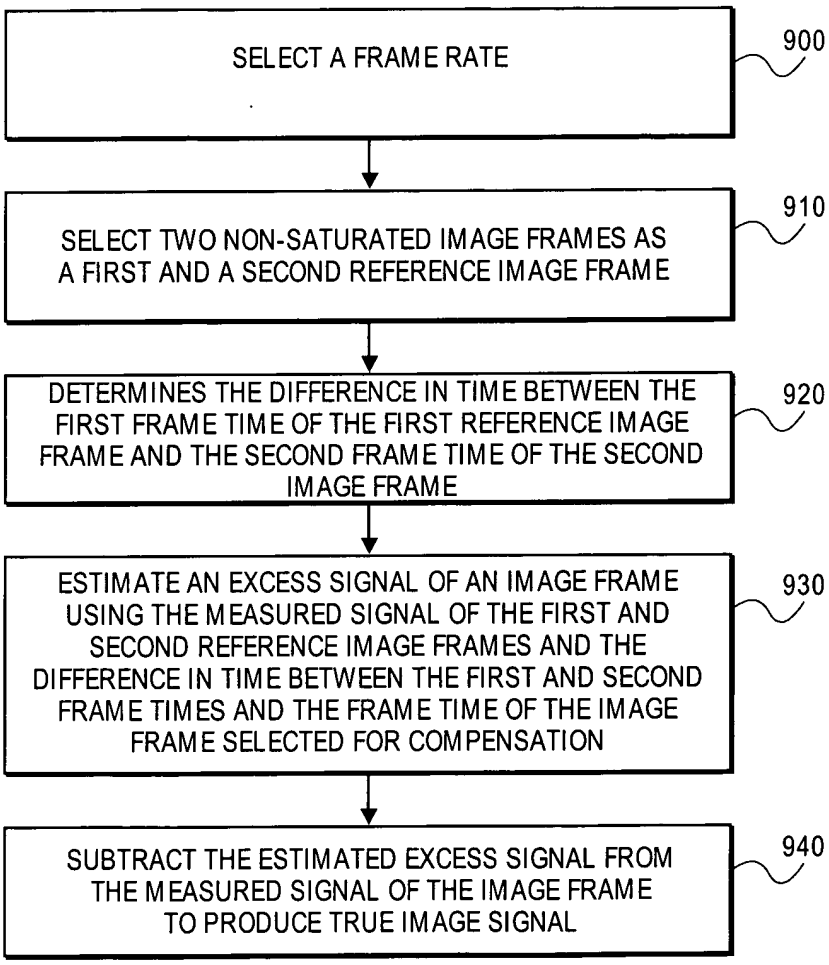
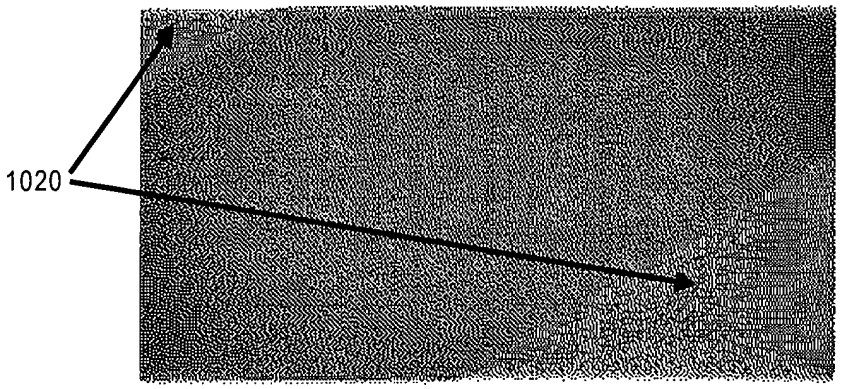
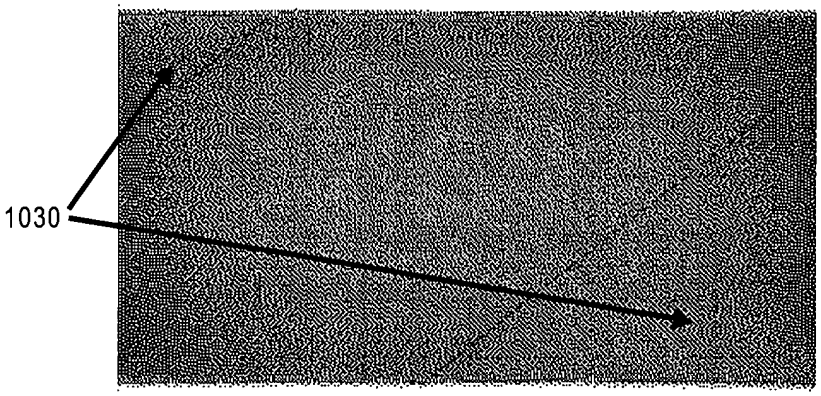

SELECT A FRAME RATE
900
SELECT TWO NON-SATURATED IMAGE FRAMES AS A FIRST AND A SECOND REFERENCE IMAGE FRAME
910
DETERMINES THE DIFFERENCE IN TIME BETWEEN THE FIRST FRAME TIME OF THE FIRST REFERENCE IMAGE FRAME AND THE SECOND FRAME TIME OF THE SECOND IMAGE FRAME
920
ESTIMATE AN EXCESS SIGNAL OF AN IMAGE FRAME USING THE MEASURED SIGNAL OF THE FIRST AND SECOND REFERENCE IMAGE FRAMES AND THE DIFFERENCE IN TIME BETWEEN THE FIRST AND SECOND FRAME TIMES AND THE FRAME TIME OF THE IMAGE FRAME SELECTED FOR COMPENSATION
930
SUBTRACT THE ESTIMATED EXCESS SIGNAL FROM THE MEASURED SIGNAL OF THE IMAGE FRAME TO PRODUCE TRUE IMAGE SIGNAL
940

FIG. 9



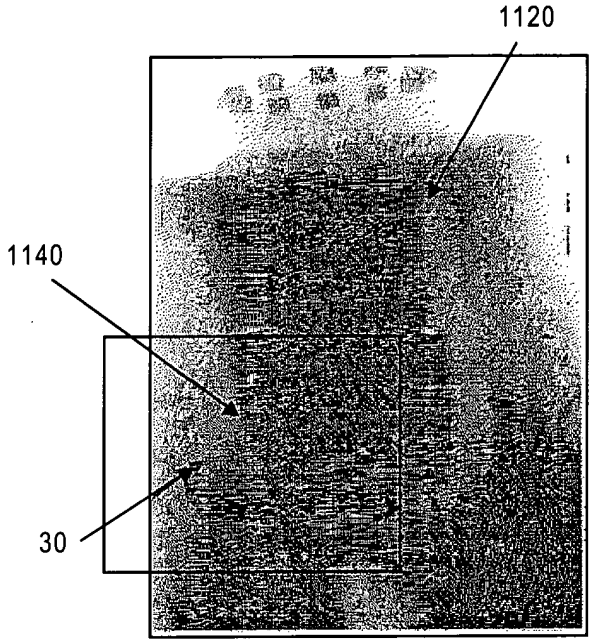
UNCOMPENSATED
FRAME F 1000

FIG. 10A



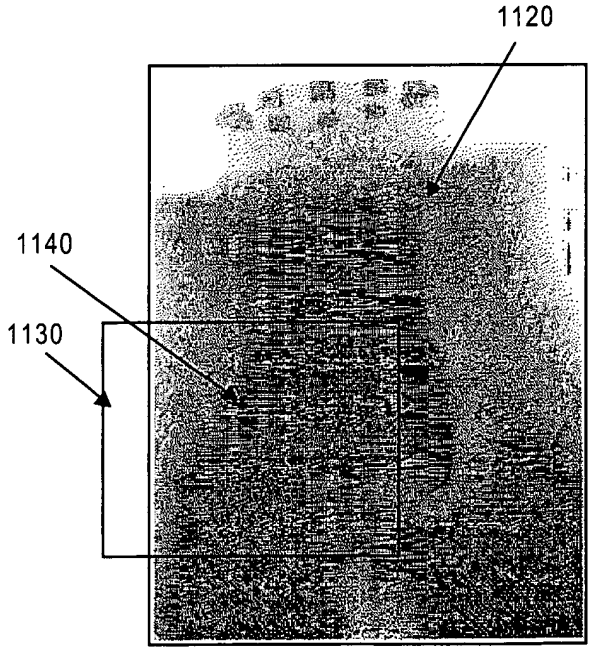
COMPENSATED
FRAME F 1010

FIG. 10B



UNCOMPENSATION FRAME
G1100

FIG. 11A



COMPENSATED FRAME
G1110

FIG. 11B

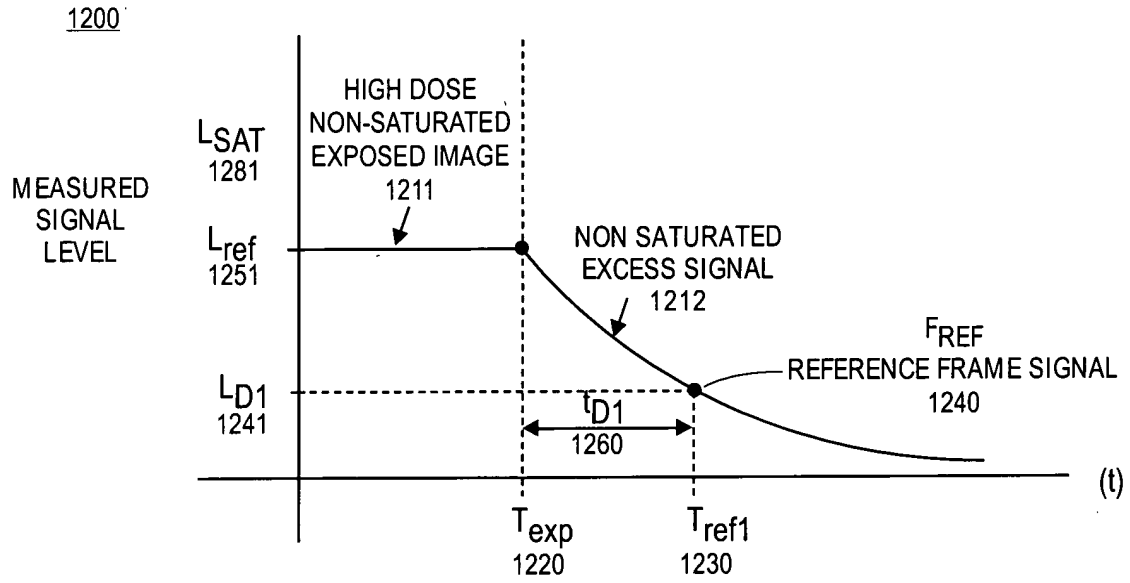

1200
HIGH DOSE
NON-SATURATED
EXPOSED IMAGE
1211
L_{SAT}
1281
MEASURED
SIGNAL
LEVEL
L_{ref}
1251
NON SATURATED
EXCESS SIGNAL
1212
F_{REF}
REFERENCE FRAME SIGNAL
1240
L_{D1}
1241
t_{D1}
1260
(t)
T_{exp}
1220
T_{ref1}
1230

FIG. 12

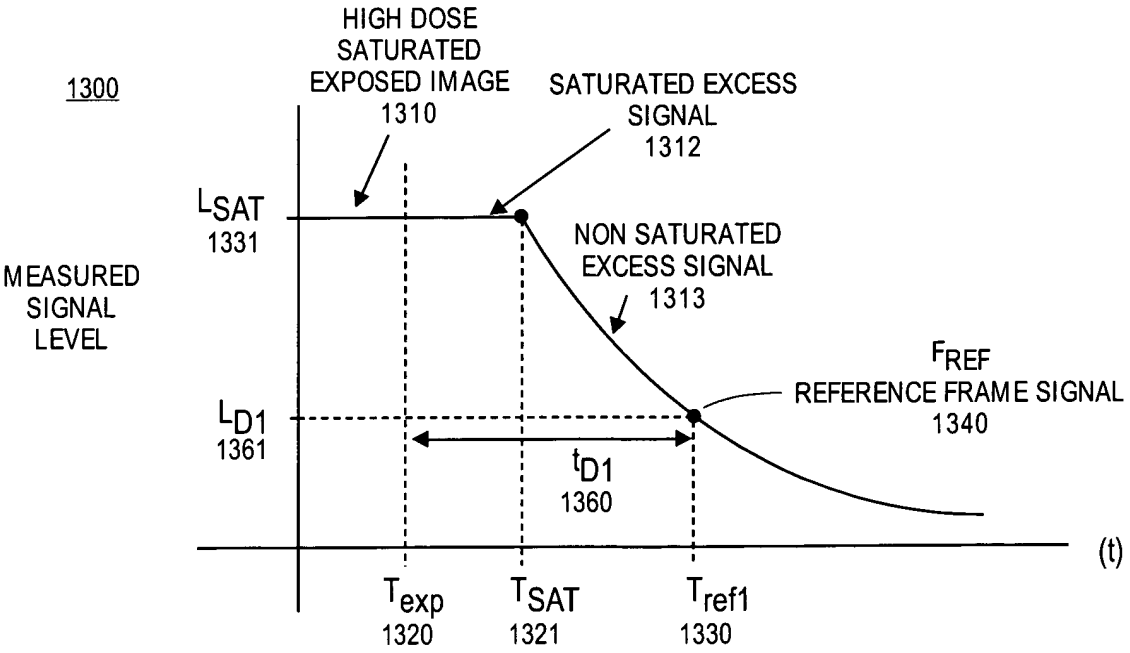

1300
HIGH DOSE
SATURATED
EXPOSED IMAGE
1310
SATURATED EXCESS
SIGNAL
1312
L_{SAT}
1331
MEASURED
SIGNAL
LEVEL
NON SATURATED
EXCESS SIGNAL
1313
F_{REF}
REFERENCE FRAME SIGNAL
1340
L_{D1}
1361
t_{D1}
1360
(t)
T_{exp}
1320
T_{SAT}
1321
T_{ref1}
1330

FIG. 13

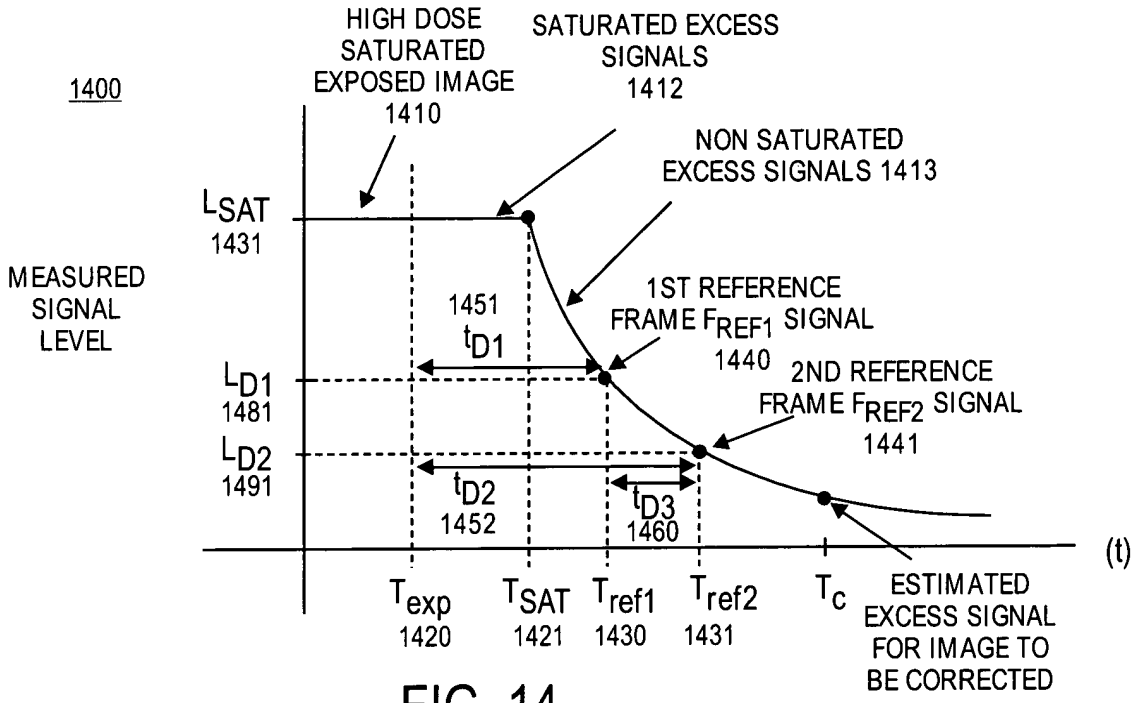

1400
HIGH DOSE SATURATED EXPOSED IMAGE 1410
SATURATED EXCESS SIGNALS 1412
NON SATURATED EXCESS SIGNALS 1413
MEASURED SIGNAL LEVEL
L_{SAT} 1431
1451 t_{D1}
1ST REFERENCE FRAME F_{REF1} SIGNAL 1440
2ND REFERENCE FRAME F_{REF2} SIGNAL 1441
L_{D1} 1481
L_{D2} 1491
t_{D2} 1452
t_{D3} 1460
(t)
T_{exp} 1420
T_{SAT} 1421
T_{ref1} 1430
T_{ref2} 1431
T_c
ESTIMATED EXCESS SIGNAL FOR IMAGE TO BE CORRECTED

FIG. 14

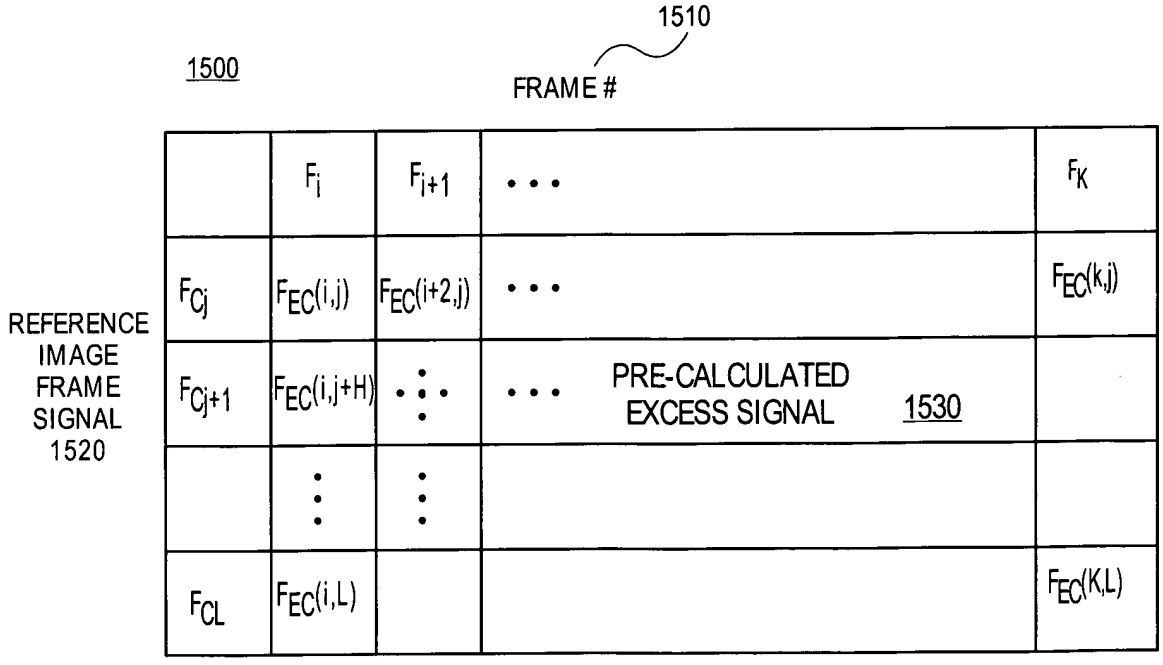

1500
1510
FRAME #
REFERENCE IMAGE FRAME SIGNAL 1520
F_i F_{i+1} • • • F_K
F_{Cj} $F_{EC(i,j)}$ $F_{EC(i+2,j)}$ • • • $F_{EC(k,j)}$
F_{Cj+1} $F_{EC(i,j+H)}$ • • • PRE-CALCULATED EXCESS SIGNAL 1530
F_{CL} $F_{EC(i,L)}$ $F_{EC(K,L)}$

FIG. 15

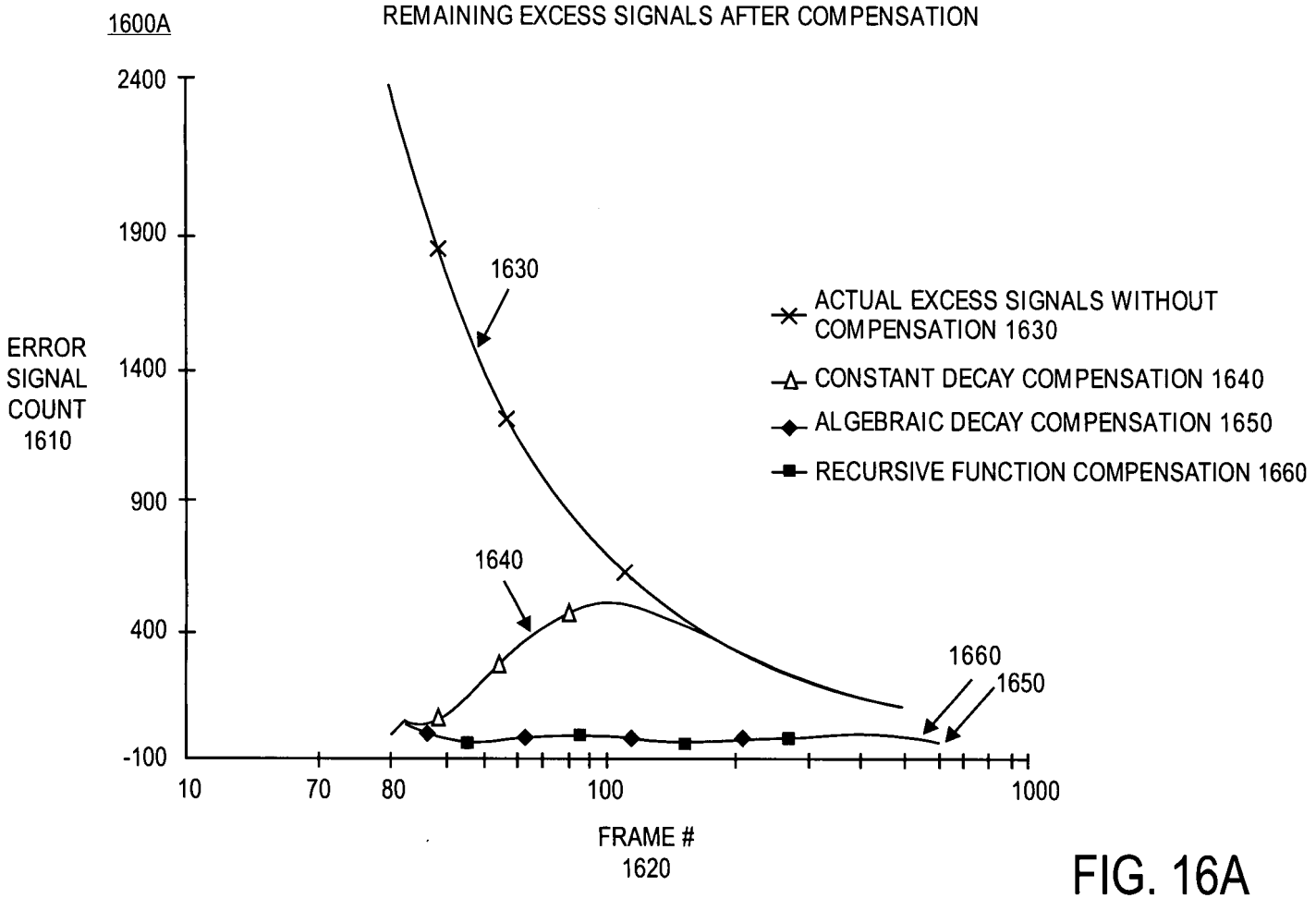

1600A
REMAINING EXCESS SIGNALS AFTER COMPENSATION
2400
1900
1400
900
400
-100
ERROR SIGNAL COUNT 1610
10
70
80
100
1000
FRAME # 1620
1630
1640
1650
1660
ACTUAL EXCESS SIGNALS WITHOUT COMPENSATION 1630
CONSTANT DECAY COMPENSATION 1640
ALGEBRAIC DECAY COMPENSATION 1650
RECURSIVE FUNCTION COMPENSATION 1660

FIG. 16A

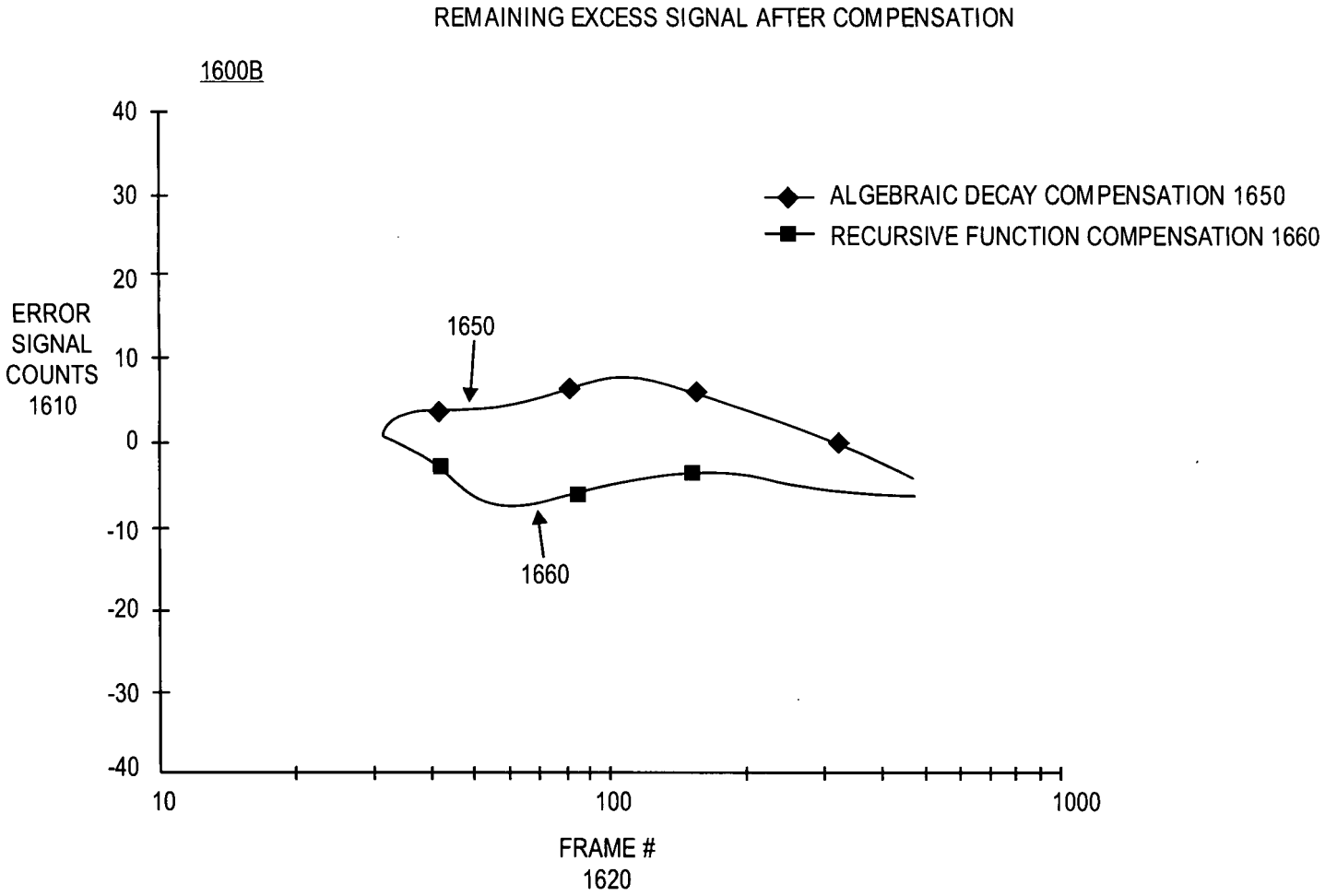

REMAINING EXCESS SIGNAL AFTER COMPENSATION
1600B
40
30
20
10
0
-10
-20
-30
-40
ERROR SIGNAL COUNTS 1610
ALGEBRAIC DECAY COMPENSATION 1650
RECURSIVE FUNCTION COMPENSATION 1660
1650
1660
10
100
1000
FRAME # 1620

FIG. 16B

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